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ABSTRACT

This study sought to demonstrate how an interactive model can be used as a "semiotic" tool to reconcile contrasting views of the role of the college professor. The study used concepts of group dynamics to study classroom leadership, climate, and expectations and a social-psychological perspective was used to analyze group interaction patterns as they were phenomonologically described. The study used a case study approach employing descriptive statistics. Subjects were 22 graduate students enrolled in an Introduction to Education Administration course. In Phase 1, they were trained as participant observers, given a course syllabus with objectives, a list of students, forms for recording their classroom responses, and a time sheet to record how many hours they studied each week. In Phase 2, data from tools distributed to the subjects were collected and tabulated weekly for 10 weeks. In Phase 3, the data were analyzed. Findings showed that a research and teaching strategy could be used to reconcile the polarity which exists when professors at higher education institutions see a conflict between the dual roles they are expected to perform--as teachers and researchers. (Contains 25 references.) (JB)

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A CONTEXTUAL ANALYSIS OF CLASSROOM INTERACTION AT THE UNIVERSITY LEVEL: AN OPERATIONS RESEARCH APPROACH

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INTRODUCTION

Research on teaching suggests that all is not well in the classroom. Over the last decade, a fair number of articles have been published on the decline of teaching quality at all levels of schooling (Simpson, 1993; Pine, 1992). Nowhere has this debate been more vigorous than among university professors and their critics (D. Souza, 1991; Bloom, 1987; Bennett, 1992). Professors are expected to balance their responsibilities as effective teachers with the career demands for research and publications. As university officials face the bleak prospects of program retrenchment, due to austere fiscal conditions, professors are being prodded to improve the quality and increase the time they spend on instruction. Indeed, many state legislators, spurred on by social "gadflies," have entered the fray over the relationship between effective teaching and time spent on research.

In view of the above dilemma, the objective of this study is to demonstrate how an interactive model can be used as a "semiotic" tool to reconcile the contrasting views on the role of the professor. Moreover, this research shows how professors can improve their teaching process by modeling themselves as: constructive motivators, subject-matter organizers, and relevant conveyors of instruction in the classroom. In addition, by using correlates of effective teaching such as "time on task" and "student participation" a "semiotic" language can be generated to provide a basis for interpretation and effective action. Jary and Jary (1991) define "semiotics" as the science that studies sign systems and grammars used as cultural codes for communication, etc. Wang, Haertel, and

Walberg (1990) did an extensive review of the literature on models of learning. They identified factors which influence students' performance. From their analysis, they found the following variables to "exhibit consistent causal influences on academic learning." They are, among others, quality of instruction, organization of subject matter, efficient use of time, motivation, classroom environment, students' reinforcement, and feedback. Although their findings appear to focus on the K-12 levels of instruction, it is reasonable to assume that the same variables are correlates of effective teaching at the university level. Katz and Henry (1988) observed that when one looks at the problem of Turning Professors into Teachers, it has to be viewed from a historical context. They note:

> "Once faculty have become aware of theories of development and the findings on which they rest, they are likely to find it impossible to teach and advise students in the traditional ways." It is not likely that proponents of the developmental theory would have had much impact had not historical events come to their aid. In the 1960 s students protested not just the impersonality of their education, but also the contents of education; not just the relevance of their studies to their lives... but also the epistemological assumptions undergirding the pursuit of knowledge (p.3).

In the above quote "relevance" is an important concept. It will be used in concert with other factors to provide the analytical scheme to answer the following questions:

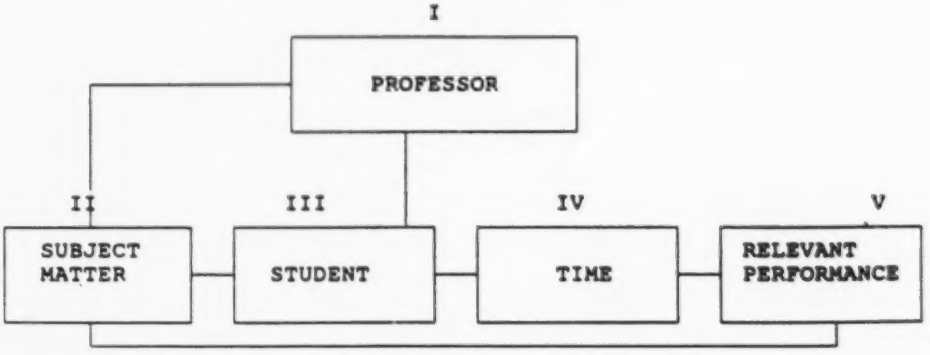
1. What is the relationship between study time and student class participation?
2. What is the relationship between extrovert/introvert personality types and the amount of study time devoted to the subject matter?
3. Is increased study time congruent with absolutely relevant student responses as contrasted to irrelevant responses?

4. Is there a significant difference between male versus female interaction?

CONCEPTUAL FRAMEWORK

The perspective for this study is taken from the literature on group processes in the classroom (Schmuck and Schmuck, 1975). The researcher used concepts on group dynamics to study classroom leadership, climate, and expectations. Reference was made to Hare's (1976) book on *Small Group Research*. Particular attention was given to his notes on the "Elements of Social Interaction" and "Task Structure." Also, a social-psychological perspective is used to analyze group interaction patterns as they are phenomenologically described by the researcher. Pictured below is the model used in this project. It represents the classroom as an input/output system where students are required to act as informed judges, and participants, using a data collection inventory to record their peers' response patterns. The patterns are generated from the collective observations of members of the classroom. They represent a cohort group involved in reciprocal interaction on topics of discussion in the subject matter.

Figure #1
P-STP MODEL OF STUDENT INTERACTION



The model above, shows that the professor is the instructional leader. He/she is responsible for the organization of instruction and delivery of the course of study. The instructor has a teaching style, values, and preferences that condition the instructional process. He/she should understand the principles of human development, learning theories, and know how they relate to students' performance. Square #2 focuses on the subject matter of the course. This is contained in the course syllabus. In order to have effective interaction, students need to understand the content which makes up the subject matter. While this is a philosophical question, mature disciplines have a knowledge base with basic "laws." This knowledge is summarized in a syllabus with clear goals, objectives and references (Altman and Cashin, 1992). In addition, the syllabus should list a weekly calendar of topics for reflexive thinking and classroom discussion. The third square represents students collectively and individually. It speaks of their value orientation, level of maturation, and cognitive development. As Katz and Henry (1988) noted earlier, it is important for professors to understand the relationship between theories of personality development and the student's learning behavior. One such theory is Jung's theory of extrovert and introvert personality types. Morris (1979, p.6) observes that:

> Jung developed a complex theory of intrapsychic processes called analytical psychology... In developing the idea of many polarities (such as conscious versus unconscious, thinking versus feeling, and progression versus regression) existing within the personality, emphasis was placed on the opposing tendencies of extroversion and introversion. The basic difference between the two lies in the person's preferences for attending to the inner world of subjectivity with an emphasis on reflective, introspective, cognitive

> activity (introversion) versus preferences for attending to the outer world of objective events with an emphasis on active involvement in the environment (extroversion).

According to Jung, these polar tendencies are necessary and healthy. Indeed, according to Morris (1979), one would do well to develop both attitudes simultaneously to achieve proper balance. However, there is a tendency for one type to emerge as dominant over the other. The question for the method proposed here is can a series of classroom instructional tools be designed such that students response patterns can be codified to conform to the specification of Jung's theory and provide a research tool to enhance the quality of university instruction? If this can be done, it will make a significant contribution to the improvement of instruction. Especially in view of Eysenck (1969) observation that: the basic difference between extrovert and introvert is biological. It is "rooted in their reticular activating system of the brain." According to Morris (1979, p.7):

> This is the system that monitors incoming neural impulses resulting from environmental stimulation and that either stimulates or inhibits responses of higher brain centers to the stimulation; the system thus controls the arousal level of the cortex of the brain.

Morris goes on to intimate that introverts seek a quiet environment whereas extroverts thrive in an environment with high and frequent arousal stimuli. From the above observation, three collateral questions can be raised: Can a research strategy be devised for the university professor to measure, as a part of instruction, differing levels of arousal? Can this research strategy provide usable results to analyze behavioral

tendencies of students in classroom participation? Can an effective teaching and research method be economically designed as a leveraging strategy to reconcile the career demands of many professors who view the two functions as polarities? The researcher will demonstrate that it can. According to the above model "time" is a "critical variable for students (Keith, 1982). It also is a critical variable for professors in teaching and research productivity. By effectively leveraging the use of time, the professor can satisfy research demands and make strong points on teaching effectiveness. The final square (number V) completes the model. It is presented to give focus to students' performance with emphasis on relevant classroom talk. By relevance, I mean to infer that students' comments can be sorted by their peers into four categories of pertinence. This speaks to the notion that the details of student discourse speak centrally to the matter being discussed. For example, a student's remark can be ranked as absolutely relevant, approximately relevant, moderately relevant, and remotely relevant. Axiomatic statements are defined as comments that are accepted as "laws or binding principles" of a discipline. They are accepted as absolutely relevant. For example, in Education Administration it is now accepted as "axiomatic" that educational institutions convey the ideologies and values of dominant interest groups. A student making such a comment would have to marshall evidence for this assertion with references, etc. The second response category is "approximately" relevant. It identifies course content and the knowledge base that is supported by hypothetical research models with propositions and arguments based on the theory of probability. Because probability theory is based on the

principle of uncertainty all comments involving the kind of data as proof (or verification) are classified as approximately relevant. According to Dewey (1933) all research knowledge of this sort is an approximation of the truth. Statements made that are possible and plausible assertions of truth are classified as "moderately" relevant. Remotely relevant assertions are the same as irrelevant. Many personal opinions for this design would fall in this cell.

METHOD AND TECHNIQUE

The methods used in this study are commensurate with the techniques of small group research (Hare, 1976). The researcher used a case study approach employing descriptive statistics.

Phase I. Students were oriented to the course. They were trained as participant observers. In addition, they received the following items:

1. One course syllabus with clearly stated objectives.
2. Alphabetized list of student members in the class with cells for recording frequencies and, their, perception of quality of classroom responses.
3. One time sheet to record the number of hours they studied each week.

Phase II. Data from these tools were collected on a weekly bases and tabulated. The study ran for 10 weeks. The reader should note that students were given points toward their grade for class participation. They were rank-ordered based on the consensus score generated by their peers. Obviously, this was a way to motivate vigorous class participation.

Phase III. Spearman's rank order correlation, and a Chi-square test were used

to analyze the data. In addition an Introvert/Extrovert Index was garnered from the data via a matrix to reveal personality types on the semiotic matrix.

The subjects for this study were 22 graduate students enrolled in an Introduction to Education Administration course. Twelve of the 22 were females and 10 were males. Twelve of the students were African Americans and ten were European Americans. All the members of the class were employed during the day as either classroom teachers, public school supervisors, or school administrators. This course was sponsored by the Adult Continuation Center for the university. The specific role of the professor was to keep the group focused and generate "Socratic" questions on relevant topics of discussion in School Administration and Organizational Behavior. The unit of analysis was a declarative sentence with reference markers (i.e., verbal cues) crafted to conform to one of the response categories. Each student as noted above (Phase I, item 2) was given an alphabetized list of their classmates names with categories for recording observations (See Figure #2).

Each student was then given a time sheet to volunteer information on the number of hours they studied each week (see Figure #3). From the information collected, a grammar was developed to characterize the pattern of interaction on the introvert/extrovert continuum. In addition, to using what Magoon (1977) called a "constructivist" approach, where research participants are allowed to construct their own interpretation of events, student's interaction patterns were analyzed. From these comments buttressed by literature, reviewed above, a symbolic pattern emerged revealing

a possible structure of classroom participation. From critical analysis.it was theorized that a student could be characterized as one of the following personality types. These possibilities are:

1. Absolutely relevant introvert/extrovert
2. Approximately relevant introvert/extrovert
3. Moderately relevant introvert/extrovert
4. Remotely relevant introvert/extrovert

In order to capture the essence of the above types, the following interaction inventory was developed.

Figure #2

FREQUENCY OF CLASS PARTICIPATION

DATE	DEGREE OF RELEVANCE			
	Absolutely	Approximately	Mildly	Remotely
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				

N=22

The names of 22 students were arrayed on the above sheet. These students were then given a copy of the time sheet depicted on the next page.

Figure #3

TIME SHEET
Indicate Number of Hours Studied Per Week

1. 0____5____10____15____20____25____30____35____40____. _____
2. 0____5____10____15____20____25____30____35____40____. _____
3. 0____5____10____15____20____25____30____35____40____. _____
4. 0____5____10____15____20____25____30____35____40____. _____
5. 0____5____10____15____20____25____30____35____40____. _____
6. 0____5____10____15____20____25____30____35____40____. _____
7. 0____5____10____15____20____25____30____35____40____. _____
8. 0____5____10____15____20____25____30____35____40____. _____
9. 0____5____10____15____20____25____30____35____40____. _____
10. 0____5____10____15____20____25____30____35____40____. _____
N=22

Using the above tools, data was collected.

To analyze the data a 22 X 22 interaction matrix was used. It allowed the analyst to correlate the pattern of intercommunication between each participant. The index generated from this matrix provided the basis for developing an indicator to measure introvert or extrovert behavior. Arrayed on the left vertical column of the matrix were the alphabetized names of 22 students. Arranged along the top horizontal axis of the matrix were the same 22 names. From this arrangement an identity matrix was designed. It provided the basis for recording frequency scores form the "Frequency of Class Participation Inventory" (See Figure #2). Marginal totals were recorded for the columns and rows of the matrix. The column totals represented each student's "talking" scores. By summing each subtotal score on the L/T dimension each student's L/T score was transformed, by the operation of division, into decimal fractions (i.e., functional scores) revealing the relative degree of introversion/extroversion observed in classroom discussion. For example, a score above 1.000 is a indicator of "extroversion." A score

below or less than 1.000, is a sign of introversion. Scores that show a balance between "listening" and "talking" will fall close to 1.000. I call this an "identity" and "symmetrical" index. The reader should be able to glean how a classroom climate score (or index) can be generated from each of the constituent subscores to reveal whether the class is basically "introverted" or "extroverted." The surface structure of the generic classroom climate is the sum of the deep structural relationship that exist between constituent sub-units... or personality types. This has important implications for introverts since this personality type prefers, according to Jung, a different group interaction style and climate.

RESULTS

The data taken from the instruments used above showed that over a period of ten weeks, 22 students recorded a total of 2,977 observations. Table #1 shows the total scores for rows and columns. Two scores were identified for each participant on the listening and talking (L/T) dimensions. Columns 1 shows the combined or summated scores for all students. Column 2 reflects a "breakout" of the "listening scores." Column 3 shows the breakout (i.e., subscores) for students observed "talking" (verbalizing) in classroom interaction.

TABLE #1

TABLE OF PARTICIPANTS
SCORES FROM INTERACTION/IDENTITY
MATRIX

NAMES	Combined Scores	Listening Scores	Talk-Scores	Functions
	L/T	(Breakout)	(Breakout)	Balance
1. Bobby, A.	337	129	208	1.612
2. Pryce, B.	192	61	131	2.147
3. Edna, B.	421	241	180	0.746
4. Estelle, B.	424	268	156	0.582
5. Josepe, B.	556*	270	286	1.059
6. Lois, C.	239	63	176	2.793
7. Marion, D.	215	112	103	0.919
8. Judy, D.	289	90	199	2.211
9. James, D.	182*	43	139	3.232
10. Harris, D.	149	133	16	0.120
11. George, F.	278	110	168	1.527
12. Harris,G.	204	103	101	0.980
13. Willie, K.	105	56	49	0.875
14. Mary, M.	184	80	104	1.300
15. David, M.	296	183	113	0.617
16. Shirley, M.	226	125	101	0.808
17. Earnestine, P.	299	163	136	0.834
18. Mary, P.	160	133	27	0.203
19. Carol, S.	250	146	104	0.712
20. Sarah, S.	438	280	158	0.564
21. Nancy, S.	212	66	146	2.212
22. Mary, Y.	298	122	176	1.442
TOTALS	2,977	2,977	2,977	1.000

*Note that student #9, James D. has the highest extrovert index of 3.232. However, student #5, Josepe, B. has a higher combined L/T score of 556. Moreover, she shows a more balanced pattern of interaction with a "functions" score of 1.059.

Another important variable used in this study is the amount of study time. Table #2 shows the correlation between the rank order of students on number of hours studied over ten weeks and their corresponding rank on the "Talking Scores."

TABLE #2
WITH RANK ORDER SCORES ON "TALKING" AND "TIME"
VARIABLES USING SPEARMAN'S FORMULA

Subjects	Talking Scores (X)	Rank Order	(Y) Matching Time Scores	Rank Order (X) Scores	Rank Order (Y) Scores	RX-RY	d^2
A.	286	1	122	1	2	1.0	1
B.	208	2	126	2	1	1.0	1
C.	199	3	46	3	12	.9	81
D.	180	4	22	4	20	16.00	256
E.	176	5	77	5	4	1.0	1
F.	176	6	59	6	8.5	1.5	2.3
G.	168	7	70	7	5	2.0	4.0
H.	158	8	29	8	19	11.0	121.
I.	156	9	90	9	3	6.0	36.
J.	146	10	30	10	17	7.0	49.
K.	139	11	16	11	21	10.0	100.
L.	136	12	69	12	6	6.0	36
M.	131	13	40	13	14	1.0	1
N.	113	14	66	14	7	7.0	49
O.	104	15	47	15	11	4.0	16
P.	104	16	39	16	15	1.0	1
Q.	103	17	52	17	10	7.0	49
R.	101	18	44	18	13	5.0	25
S.	101	19	59	19	8.5	10.5	110.5
T.	49	20	28	20	18	2.0	4
U.	27	21	34	21	16	5.0	25.
V.	16	22	11	22	22	0	0
TOTALS	2,977		1,176				$968.8 = d^2$

R_s = + .453

The index of $R_s = +.45$ shows a moderate congruence in the direction hypothesized. The reader should note that this is a nonparametric hypothesis. It is used in the tradition of operations research to analyze and describe the behavior of individuals in a social system like the classroom. Table #3 shows the interaction patterns for male and female students involved in class discussion. The patterns of communication have been reduced to "Introvert" and "Extrovert" indicators to facilitate the use of a Chi-Square test.

TABLE #3

CHI SQUARE TEST
SHOWING THE RELATIONS BETWEEN MALE AND FEMALES
ON INTROVERT/EXTROVERT DIMENSION

	INTROVERT	EXTROVERT	TOTALS
MALE	7 (5.5)	3 (4.5)	10
FEMALE	5 (6.5)	7 (5.5)	12
TOTALS	12	10	22

df = 1
X^2 = 1.829 Not significant at the 0.05 level
The following X^2 formula was used:

$$X^2 = \frac{(|fo - fe| - .5)^2}{fe}$$

This formula features Yates' correction. It is calculated according to the procedure outlined by Healey (1990).

The final "data base" used in this study is listed in Table #5. It shows a breakdown in student class participation. This is determined by the perceptions of students, reciprocally, involved in class discussions over a ten-week period. (The instrument used to collect these data is listed in Figure #1).

The reader will note that of the 2,977 observations made by members of the class, 810 (or 27%) were identified as "absolutely relevant" responses; 1187 (or 40%) were

classified as moderately relevant responses; and 196 (or 7%) were classified as remotely relevant.

TABLE #4

Breakdown in Talking Scores by
Perceived Relevance

Students	Talking Scores	Absolutely Relevant	Approximately Relevant	Moderately Relevant	Remotely Relevant
1)	286	39	126	85	36
2)	208	27	91	71	19
3)	199	23	87	67	22
4)	180	42	68	53	17
5)	176	49	73	30	24
6)	176	61	59	51	5
7)	168	53	61	47	7
8)	158	33	73	42	10
9)	156	71	62	19	4
10)	146	17	83	44	2
11)	139	20	31	52	36
12)	136	28	70	31	7
13)	131	48	52	30	1
14)	113	73	27	13	0
15)	104	15	56	31	2
16)	104	34	40	30	0
17)	103	73	19	11	0
18)	101	19	45	37	0
19)	101	22	39	36	4
20)	49	36	12	1	0
21)	27	17	7	3	0
22)	16	10	6	0	0
Total: N=22	2,977	810 (27%)	1,187 (40%)	784 (26%)	196 (7%)

DISCUSSION

At the beginning of this study four questions were raised. They focused on analyzing the relationship between the following variables: study time and class

participation; personality types and amount of study time; relevant responses; and differences between males and females in patterns of classroom interaction. From these variables the following hypothesis were tested:

H_1 There is a high correlation between study time and class participation. Table 2 shows a correlation of $R_2 = +.45$. This is a moderate correlation. It does not confirm a high congruence; although, there is an association in the positive direction (See data on page 15).

H_2 There is a high congruence between personality types and the amount of time spend studying. This hypothesis is confirmed. $R_s = +.86$. To test this hypothesis data was taken from Table #1. Data in column (4) of the "functions" category were rank ordered, as illustrated below (i.e., Table 5). Also note, that the calculation is based on a sample of N=22.

Table #5

SHOWING THE RELATIONSHIP BETWEEN
EXTROVERT PERSONALITY TYPES AND STUDY TIME

	Index Extrovert	Rank/Index	Time	Time Rank	d	d^2
A	3.232	1	16	10	-9	81
B	2.793	2	77	3	-1	1
C	2.212	3	30	9	-6	36
D	2.211	4	46	7	-3	9
E	2.147	5	40	8	-3	9
F	1.612	6	126	1	5	25
G	1.527	7	70	4	3	9
H	1.442	8	59	5	3	9
I	1.300	9	47	6	3	9
J	1.059	10	122	2	8	64

RS = +.86 252 = d^2

A similar procedure was followed in testing hypothesis number 3 below.

H_3 There is a high correlation between increased study time and absolutely relevant response rates.

The reader should note this hypothesis was tested for students classified as introverted on the extrovert/introverted data listed in Table #1. Two correlations were made with Spearman's rank order procedure to provide confirmation for the hypothesis. The results are listed in Table #6.

TABLE #6

Showing the Relationship Between Study Time/Absolutely Relevant Responses

Students' Introvert Index		Absolute Relevance
Study Time	.88	.93

Finally, using a Chi-square test hypothesis number four was assessed.

H_4 There is no significant difference between the interaction patterns of males and females involved in class participation.

An X^2 index of 1.829 indicated that there was no significant difference in the interaction patterns between male and female students. Therefore it was not rejected. (See Table #3, page 16).

FINDINGS

The findings from this study show that a research and teaching strategy can be used to recouncile the polarity which exists between professors at higher education institutions who see a disparity between the dual roles they are expected to perform as teachers and researchers. Given the constraints of time and resources, the foregoing

strategy may be useful for increasing students'learning involvement. In addition, tools presented here enable the professor to "harvest" an easy source of valuable data that can increase research productivity. In addition, it can have a positive impact on the quality of instruction andstudents'performance. The author makes this claim because the findings from this study comports with the results from other researchers who have investigated: the professor's tasks in connecting diverse learners to important subject-matter knowledge (Kennedy, 1991); the introverted/extroverted personalities of students and the impact it has on classroom instruction (Cunningham, 1975); the effects of study time on students' performance (Carroll, 1963); and the effects of cues, participation and corrective feedback on student's performance (Lysakowski and Walberg, 1982). The findings also support the use of "semiotic" strategies which comport with Schole's (1982) observations on employing Peirce's theory signs. "In Peirce's theory of signs,a sign is indexical to the extent that there is a phenomenal or existential connection between the sign and what is signifies" (Scholes, 1982). Finally, it is recommended that intercorrelations be made between the data collected with the "Frequency of Class Participation" inventory to determine the reliability and validity of data collected with this instrument (Frick and Semmel, 1978). Also, larger sample sizes should be used to determine generalizability of these conjectures.

SUMMARY AND CONCLUSION

The purpose of this study was to explore the effects of study time on the frequency and relevance of students'responses in class participation. The research developed and

explored the use of two data collecting tools designed to operationalize the concepts" "relevance" and "study time." This was done--in a class participation framework--to see if they provide a methodological basis for analyzing informed class discussion. The procedures used in this study are commensurate with the techniques of small group dynamics and interaction analysis. The objective of the model was to provide an instructional pay-off matrix to "grammaticize" in "semiotic terms" a range of possible outcomes linked to students' achievement behavior in an "introvert or extrovert" classroom climate. The intent of the study was to provide the university professor with an exportable teaching and research tool for strengthening class instruction via students' interaction. In addition, communication patterns were analyzed and shared with students. The approach generated a number of directive hypotheses to direct the "conceptual" and "practical" fortunes of professors, etc., in pursuit of educational excellence. Finally, students learned to use several statistical procedures because they could see themselves involved in the research project. Their final grades correlated positively with the results, although that data was not included due to time constraints.

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